General Specifications

Item	Specification
Generator	
4.6L, Cobra	120 amps @ 6,000 pulley rpm (2.87:1 ratio) internal regulator
4.6L, Mach1	120 amps @ 6,000 pulley rpm (2.72:1 ratio) internal regulator
4.6L, 2V	110 amps @ 6,000 pulley rpm (3.16:1 ratio) internal regulator
3.8L	110 amps @ 6,000 pulley rpm (2.79:1 ratio) internal regulator

Charging System

The charging system is a negative ground system consisting of the following:

- generator
- internal voltage regulator
- charging system warning indicator
- storage battery
- necessary wiring and cables

The generator is belt-driven by the engine accessory drive system.

With the ignition key in the run position, voltage is applied through the warning indicator I circuit to the voltage regulator. This turns the regulator on, allowing current to flow from battery sense A circuit to the generator field coil. When the engine is started, the generator begins to generate alternating current (AC) which is converted to direct current (DC) internally. This current is then supplied to the vehicle's electrical system through the output terminal (B+) of the generator.

Once the generator begins generating current, a voltage signal is taken from the generator stator and fed back to the internal regulator. This voltage feedback signal (typically half the battery voltage) is used to turn off the warning indicator.

With the system functioning normally, the generator output current is determined by the voltage of the A circuit. This A circuit voltage (battery sense circuit) is compared to a set voltage internal to the regulator, and the regulator controls the generator field current to maintain the correct generator output.

The set voltage will vary with temperature and is typically higher in cold temperatures than in warm temperatures. This allows for better battery recharge in the winter and reduces the chance of overcharging in the summer.

The battery is a 12 volt direct current source connected in a negative ground system. The battery case is sealed and includes two vent holes to release gases. The battery has three major functions:

- engine cranking power source
- voltage stabilizer for the electrical system
- temporary power when electrical loads exceed the generator output current

Circuit Description

Battery Output Terminal (B+)

The generator output is supplied through the battery positive output (B+) terminal on the back of the generator to the battery and electrical system.

I Circuit 904 (LG/RD)

The I (ignition) circuit is used to turn on the voltage regulator. This circuit is powered up with the ignition key in the run position. This circuit is also used to turn the charging system warning indicator on if there is a fault in the charging system operation.

A Circuit 36 (YE/WH)

The A circuit or battery sense circuit is used to sense battery voltage. This voltage is used by the regulator to determine generator output. This circuit is also used to supply current to the generator field (rotor). The amount of current supplied to the rotor determines generator output.

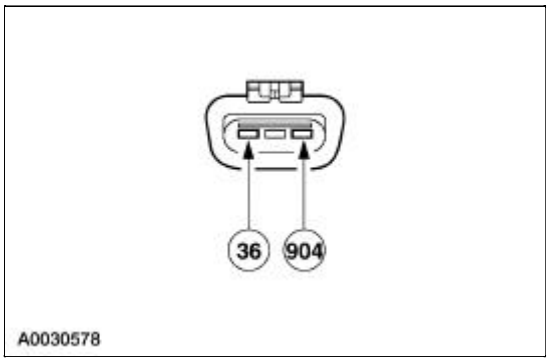
Charging System

Refer to Wiring Diagrams Cell 12 , Charging System for schematic and connector information.

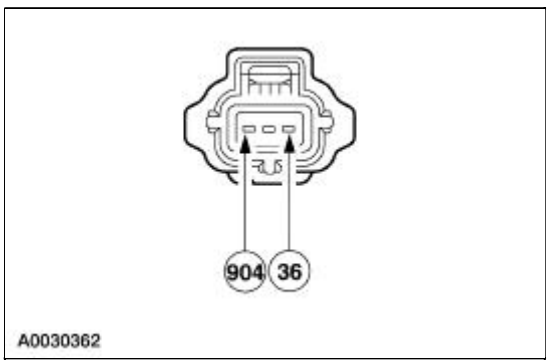
Special Tool(s)

ST1137-A	73III Automotive Meter 105-R0057 or equivalent
ST2173-A	SABRE Premium Battery and Electrical System Tester 010-00736 or equivalent

Principles of Operation



Connector C102c End View
A Circuit 36 (YE/WH)
I Circuit 904 (LG/RD)



Connector C102a End View
A Circuit 36 (YE/WH)
I Circuit 904 (LG/RD)

Functionality

With the ignition switch in the RUN position, voltage is applied through the warning indicator I circuit 904 (LG/RD) to the voltage regulator. This turns the regulator on, allowing current to flow from battery sense A circuit 36 (YE/WH) to the generator field coil. When the engine is started, the generator begins to generate alternating current (AC) which is internally converted to direct current (DC). This current is then supplied to the vehicle's electrical system through the output (B+) terminal of the generator.

Once the generator begins generating current, a voltage signal is taken from the generator stator and fed back to the regulator internally. This voltage feedback signal (typically half the battery voltage) is used to turn off the warning indicator.

With the system functioning normally, the generator output current is determined by the voltage of the A circuit. The A circuit voltage is compared to a set voltage internal to the regulator, and the regulator controls the generator field current to maintain the correct generator output.

The set voltage will vary with temperature and is typically higher in cold temperatures and lower in warm temperatures. This allows for better battery recharge in the winter and reduces the chance of overcharging in the summer.

Battery Positive Output Circuit 38 (B+) (BK/OG)

The generator output is supplied through the battery positive output (B+) terminal on the back of the generator to the battery and electrical system.

I Circuit 904 (LG/RD)

The I (ignition) circuit is used to turn on the voltage regulator. This circuit is powered up with the ignition key in the run position. This circuit is also used to turn the charging system warning indicator on if there is a fault in the charging system operation.

A Circuit 36 (YE/WH)

The A circuit or battery sense circuit is used to sense battery voltage. This voltage is used by the regulator to determine generator output. This circuit is used to supply current to the generator field (rotor). The amount of current supplied to the rotor will determine generator output.

Inspection and Verification

WARNING: Batteries contain sulfuric acid. Avoid contact with skin, eyes, or clothing. Also, shield your eyes when working near batteries to protect against possible splashing of the acid solution. In case of acid contact with skin or eyes, flush immediately with water for a minimum of 15 minutes and get prompt medical attention. If acid is swallowed, call a physician immediately.

WARNING: Batteries normally produce explosive gases which can cause personal injury. Therefore, do not allow flames, sparks or lighted substances to come near the battery. When charging or working near a battery, always shield your face and protect your eyes. Always

provide ventilation.

WARNING: When lifting a plastic-cased battery, excessive pressure on the end walls could cause acid to spew through the vent caps resulting in personal injury, damage to the vehicle or to the battery. Lift with a battery carrier or with your hands on opposite corners.

1. Verify the customer concern by operating the engine to duplicate the concern.

2. Inspect the charging system (battery, generator cable, harness connectors, connections) to determine if any obvious mechanical or electrical concerns exist. If found, repair as necessary and test the system for normal operation. Refer to the following tables:

Visual Inspection Chart

Mechanical	Electrical
● Battery case, posts, hold-down clamp, cables and connections ● Generator drive (serpentine) belt for condition and tension. Refer to Section 303-05 . ● Generator pulley	● Battery junction box (BJB) fuse 20 (20A) ● Fuse links ● Circuitry ● Battery charge warning indicator ● Cables

3. Check the operation of the charging system warning indicator lamp (instrument cluster). Normal operation is as follows:
   - With the ignition switch OFF, the charging system warning indicator should be OFF.
   - With the ignition switch in RUN and the engine off, the charging system warning indicator light should be on.
   - With the engine running, the charging system warning indicator light should be off.

4. Verify the battery is being charged. Carry out the Battery—Load Test. Refer to Component Tests in this section.

Normal Charging System Voltages

Ignition Switch Position	A Circuit 36 (YE/WH)	I Circuit 904 (LG/RD)	Generator B+ Circuit 38 (BK/OG)	Battery	Engine to battery ground	Charging System Warning Indicator Operation
OFF	12V	0V	12V	12V	0V	Off
RUN-engine off	12V	1-3V	12V	12V	0V	Illuminated
RUN-engine running	13-15V	13-15V	13-15V	13-15V	0V	Off

5. If the customer concern is verified after the initial inspection, refer to the Symptom Chart to determine which tests to carry out.

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
• Battery is discharged or voltage is low	• Circuitry. • High key-off current drain(s). • Battery. • Generator.	• Go To Pinpoint Test A.
• The charging system warning indicator is on with the engine running (the system voltage does not increase)	• Circuitry. • Voltage regulator. • Generator.	• Go To Pinpoint Test B.
• The system overcharges (the battery voltage is greater than 15.5 volts)	• Circuitry. • Voltage regulator. • Generator.	• Go To Pinpoint Test C.
• The charging system warning indicator is on with the engine running and the battery increases voltage	• Circuitry. • Instrument cluster. • Voltage regulator. • Generator.	• Go To Pinpoint Test D.
• The charging system warning indicator is off with the ignition switch in the RUN position and the engine off	• Bulb. • Circuitry. • Instrument cluster. • Voltage regulator. • Generator.	• Go To Pinpoint Test E.
• The charging system warning indicator flickers or is intermittent	• Central junction box (CJB) fuse 5 (15A). • Generator connector unplugged (C102a). • Circuitry. • Generator.	• Go To Pinpoint Test F.
• The generator is noisy	• Bolts or brackets. • Drive belt. • Generator or pulley.	• Go To Pinpoint Test G.
• Radio interference	• Generator. • Circuitry. • In-vehicle entertainment system.	• Go To Pinpoint Test F.

Pinpoint Tests

CAUTION: Do not make jumper connections except as directed. Incorrect connections may damage the voltage regulator test terminals, fuses, or fuse links.

CAUTION: Do not allow any metal object to come in contact with the generator housing and internal diode cooling fins.

NOTE: All voltage measurements are referenced to the negative (-) battery post unless otherwise specified.

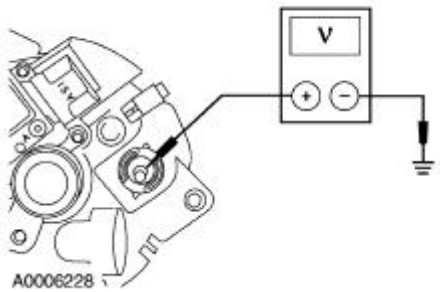
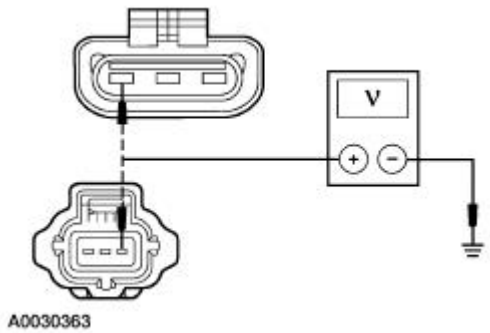
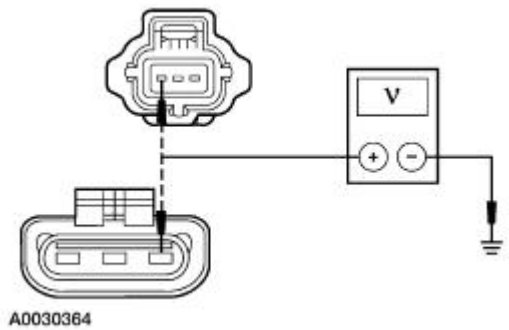
PINPOINT TEST A: BATTERY IS DISCHARGED OR VOLTAGE IS

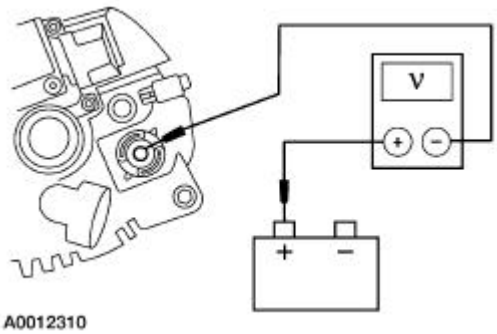
LOW

Test Step	Result / Action to Take
A1 CHECK BATTERY CONDITION ● Carry out the Battery—Condition Test to determine if the battery can hold a charge and is OK for use. Refer to Section 414-01 . ● **Is the battery OK?**	**Yes** GO to A2 . **No** INSTALL a new battery. REFER to Section 414-01 . TEST the system for normal operation.
A2 CHECK THE GENERATOR OUTPUT ● Carry out the On-Vehicle Generator Load/No Load Test. Refer to Component Tests in this section. ● **Is the generator OK?**	**Yes** GO to A3 . **No** GO to Pinpoint Test B .
A3 CHECK FOR CURRENT DRAINS ● Carry out the Battery—Drain Test. Refer to Component Tests in this section. ● **Are there any excessive current drains?**	**Yes** REPAIR as necessary. TEST the system for normal operation. **No** GO to A4 .
A4 CHECK FOR CURRENT DRAINS WHICH SHUT OFF WHEN THE BATTERY IS DISCONNECTED ● Carry out the Battery—Electronic Drains Which Shut Off When the Battery Cable is Disconnected Test. Refer to Component Tests in this section. ● **Are there any current drains which shut off when the battery is disconnected?**	**Yes** REPAIR as necessary. TEST the system for normal operation. **No** GO to Pinpoint Test B .

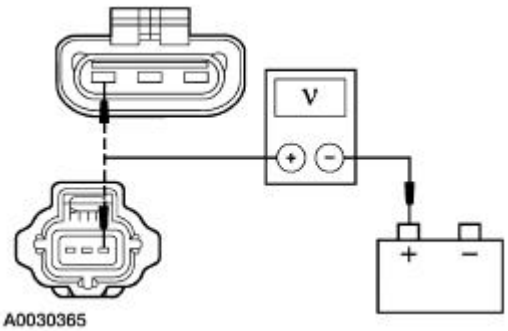
PINPOINT TEST B: THE CHARGING SYSTEM WARNING INDICATOR IS ON WITH THE ENGINE RUNNING (THE BATTERY VOLTAGE DOES NOT INCREASE)

Test Step	Result / Action to Take
B1 CHECK GENERATOR B+ CIRCUIT 38 (BK/OG) ● Disconnect: Generator B+ C102b. ● Measure the voltage between the generator C102b, circuit 38 (BK/OG), component side and ground.	**Yes** GO to B2 . **No** REPAIR the circuit. TEST the system for normal operation.

 ● **Is the voltage equal to battery positive voltage (B+)?**	
B2 CHECK GENERATOR A CIRCUIT 36 (YE/WH)	**Yes** GO to B3 . **No** REPAIR the circuit. TEST the system for normal operation.
● Disconnect: Generator C102c (4.6L 4V) or C102a (3.8L or 4.6L 2V). ● Measure the voltage between the generator C102c (4.6L 4V) or C102a (3.8L or 4.6L 2V) pin 3, circuit 36 (YE/WH), harness side and ground.  ● **Is the voltage equal to battery positive voltage (B+)?**	
B3 CHECK I CIRCUIT 904 (LG/RD) FOR AN OPEN	**Yes** GO to B4 . **No** REPAIR the circuit. TEST the system for normal operation.
● Key in ON position. ● With the ignition switch in the RUN position and the engine off, measure the voltage between the generator C102c (4.6L 4V) or C102a (3.8L or 4.6L 2V) pin 1, circuit 904 (LG/RD), harness side and ground.  ● **Is the voltage equal to battery positive voltage (B+)?**	
B4 CHECK FOR VOLTAGE DROP IN B+ CIRCUIT 38 (YE/WH)	**Yes** INSTALL a new generator. REFER to Section 414-02 . TEST the system for normal operation. **No**
● Key in START position. ● With the engine at 2,000 rpm, measure the voltage drop between the generator C102b, circuit 38 (BK/OG), component side and positive battery terminal.	

 A0012310 ● **Is the voltage drop less than 0.5 volt?**	REPAIR high resistance in the B+ circuit 38 (BK/OG). TEST the system for normal operation.

PINPOINT TEST C: THE SYSTEM OVERCHARGES (THE BATTERY VOLTAGE IS GREATER THAN 15.5 VOLTS)

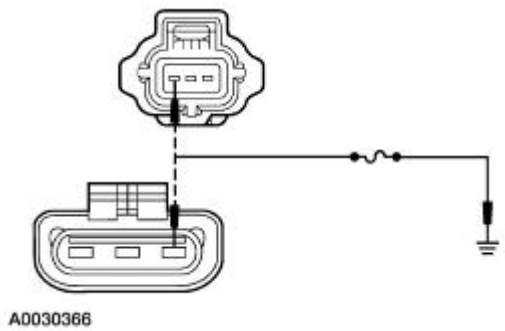
Test Step	Result / Action to Take
C1 CHECK FOR VOLTAGE DROP IN A CIRCUIT 36 (YE/WH)	
● Disconnect: Generator C102c (4.6L 4V) or C102a (3.8L or 4.6L 2V). ● Key in ON position. ● Measure the voltage drop between the generator C102c (4.6L 4V) or C102a (3.8L or 4.6L 2V) pin 3, circuit 36 (YE/WH), harness side and positive battery terminal.  A0030365 ● **Is the voltage drop less than 0.5 volt?**	**Yes** GO to C2 . **No** REPAIR the high resistance in A circuit 36 (YE/WH). TEST the system for normal operation.
C2 CHECK GENERATOR AND BATTERY GROUND CONNECTIONS	
● Key in OFF position. ● Check the ground connections between the voltage regulator and the generator and the engine, and the battery and the engine. ● **Are all ground connections clean and tight?**	**Yes** INSTALL a new generator. REFER to Section 414-02 . TEST the system for normal operation. **No** REPAIR ground connections as necessary. TEST the system for normal operation.

PINPOINT TEST D: THE CHARGING SYSTEM WARNING INDICATOR IS ON WITH THE ENGINE RUNNING AND THE BATTERY

INCREASES VOLTAGE

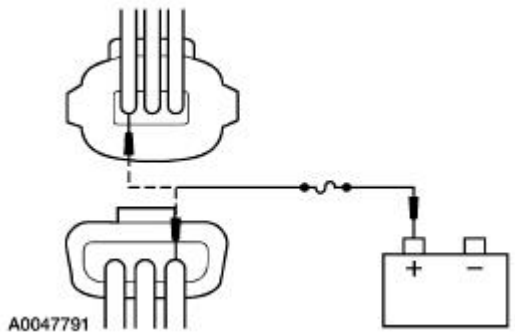
Test Step	Result / Action to Take
D1 CHECK I CIRCUIT 904 (LG/RD) FOR A SHORT TO GROUND	
• Disconnect: Generator C102c (4.6L 4V) or C102a (3.8L or 4.6L 2V). • Key in ON position. • With the ignition switch in the RUN position, check the charging system warning indicator. • **Is the charging system warning indicator illuminated?**	**Yes** REPAIR circuit 904 (LG/RD) for a short to ground. TEST the system for normal operation. **No** INSTALL a new generator. REFER to Section 414-02 . TEST the system for normal operation.

PINPOINT TEST E: THE CHARGING SYSTEM WARNING INDICATOR IS OFF WITH THE IGNITION SWITCH IN THE RUN POSITION AND THE ENGINE OFF

Test Step	Result / Action to Take
E1 CHECK THE CHARGING SYSTEM WARNING INDICATOR LAMP	
• Disconnect: Generator C102c (4.6L 4V) or C102a (3.8L or 4.6L 2V). • With the engine off, connect a fused (15A) jumper wire between the generator C102c (4.6L 4V) or C102a (3.8L or 4.6L 2V) pin 1, circuit 904 (LG/RD), harness side and ground.  A0030366 • Key in ON position. • **Is the charging system warning indicator lamp illuminated?**	**Yes** INSTALL a new generator. REFER to Section 414-02 . TEST the system for normal operation. **No** REFER to Section 413-01 for diagnosis and testing of the instrument cluster.

PINPOINT TEST F: THE CHARGING SYSTEM WARNING INDICATOR LAMP FLICKERS OR IS INTERMITTENT

Test Step	Result / Action to Take
F1 CHECK FOR LOOSE CONNECTIONS	
• Check all generator, battery, and power distribution connections for looseness, corrosion, loose or bent terminals, or loose eyelets. • **Are all connections clean and tight?**	**Yes** GO to F2 . **No**

	REPAIR as necessary. TEST the system for normal operation.
F2 CHECK FUSE	
• Key in START position. • With the engine running, check battery junction box (BJB) fuse 20 (20A) in circuit 36 (YE/WH) for looseness by wiggling the fuse and noting the charging system warning indicator lamp operation. • **Does the charging system warning indicator lamp flicker?**	**Yes** REPAIR loose fuse connections as necessary. TEST the system for normal operation. **No** GO to F3.
F3 CHECK A CIRCUIT 36 (YE/WH) CONNECTIONS	
• Key in OFF position. • Connect a fused jumper wire between the generator C102c, (4.6L 4V) or C102a (3.8L or 4.6L 2V) pin 3, circuit 36 (YE/WH), harness side and the positive battery terminal.  • Key in START position. • With the engine running, note the charging system warning indicator operation. • **Does the charging system warning indicator lamp flicker?**	**Yes** REFER to Section 414-02. TEST the system for normal operation. **No** REPAIR loose connection(s) in circuits. TEST the system for normal operation.

PINPOINT TEST G: THE GENERATOR IS NOISY

Test Step	Result / Action to Take
G1 CHECK FOR ACCESSORY DRIVE NOISE	
• Check the accessory drive belt for damage and correct installation. Check the accessory mounting brackets and generator pulley for looseness or misalignment. • **Is the accessory drive OK?**	**Yes** GO to G2. **No** REPAIR as necessary. REFER to Section 303-05 for diagnosis and testing of the accessory drive system. TEST the system for normal operation.
G2 CHECK GENERATOR MOUNTING	
• Check the generator mounting for loose bolts or misalignment. • **Is the generator mounted correctly?**	**Yes** GO to G3. **No** REPAIR as necessary. TEST the system for normal operation.
G3 CHECK GENERATOR FOR ELECTRICAL	

NOISE	
• Disconnect: Generator C102c (4.6L 4V) or C102a (3.8L or 4.6L 2V). • Key in START position. • With the engine running, turn the headlights on, rear defroster on, and the blower motor to the HI position. • **Is the noise still present?**	**Yes** GO to G4 . **No** INSTALL a new generator. REFER to Section 414-02 . TEST the system for normal operation.
G4 CHECK GENERATOR FOR MECHANICAL NOISE	
• Key in OFF position. • Connect: Generator C102c (4.6L 4V) or C102a (3.8L or 4.6L 2V). • Key in START position. • Turn all accessories off. With the engine running, use a stethoscope or equivalent listening device to probe the generator for unusual mechanical noise. • **Is the generator the noise source?**	**Yes** INSTALL a new generator. REFER to Section 414-02 . TEST the system for normal operation. **No** REFER to Section 303-00 to diagnose the source of engine noise.

PINPOINT TEST H: RADIO INTERFERENCE

Test Step	Result / Action to Take
H1 VERIFY GENERATOR IS SOURCE OF RADIO INTERFERENCE	
• Key in START position. • With the engine running, tune the radio to a station where the interference is present. • Key in OFF position. • Disconnect: Generator C102c (4.6L 4V) or C102a (3.8L or 4.6L 2V). • Key in START position. • With the engine running, note any radio interference. • **Is the interference present with the generator disconnected?**	**Yes** REFER to Section 415-00 for diagnosis and testing of the in-vehicle entertainment system. **No** INSTALL a new generator. REFER to Section 414-02 . TEST the system for normal operation.

Component Tests

Battery—Load Test

1. With the engine running, turn the A/C on, the blower motor on high speed and the headlamps on high beam.

2. Increase the engine speed to approximately 2,000 rpm. The voltage should increase a minimum of 0.5 volt above the base voltage.
   - If the voltage does not increase as specified, carry out the Generator On-Vehicle Tests. For additional information, refer to Generator On-Vehicle Tests in this section.
   - If the voltage increases as specified, the charging system is operating normally.

Battery—Drain Tests

NOTE: No production vehicle should have more than a 50 mA (0.050 amp) continuous draw.

Check for current drains on the battery in excess of 50 milliamps (0.050 amp) with all the electrical accessories off and the vehicle at rest. Current drains can be tested with the following procedure:

WARNING: Do not attempt this test on a lead-acid battery that has recently been recharged. Explosive gases can cause personal injury.

CAUTION: To prevent damage to the meter, do not crank the engine or operate accessories that draw more than 10A.

NOTE: Many modules draw 10 mA (0.010 amp) or more continuously.

NOTE: Use an in-line ammeter between the battery positive or negative post and its respective cable.

NOTE: Typically, a drain of approximately one amp can be attributed to an engine compartment lamp, glove compartment lamp, or luggage compartment lamp staying on continually. Other component failures or wiring shorts may be located by selectively pulling fuses to pinpoint the location of the current drain. When the current drain is found, the meter reading will fall to an acceptable level. If the drain is still not located after checking all the fuses, it may be due to the generator.

NOTE: To accurately test the drain on a battery, an in-line digital ammeter must be used. Use of a test lamp or voltmeter is not an accurate method due to the number of electronic modules.

1. Make sure the junction box/fuse panels are accessible without turning on interior and underhood lights.

2. Drive the vehicle at least five minutes and over 48 km/h (30 mph) to turn on and exercise vehicle systems.

3. Allow the vehicle to sit with the key off for at least 40 minutes to allow modules to time out/power down.

4. Connect a fused jumper wire between the negative battery cable and the negative battery post to prevent modules from resetting and to catch capacitive drains.

5. Disconnect the negative battery cable from the post without breaking the connection of the jumper wire.

6. **NOTE:** It is very important that continuity is not broken between the battery and the negative battery cable when connecting the meter. If this happens, the entire procedure must be repeated.

   Connect the tester between the negative battery cable and the post. The meter must be capable of reading milliamps and should have a 10 amp capability.

7. **NOTE:** If the meter settings need to be switched or the test leads need to be moved to another jack, the jumper wire must be reinstalled to avoid breaking continuity.

   Remove the jumper wire.

NOTE: Amperage draw will vary from vehicle to vehicle depending on the equipment package. Compare to a comparable vehicle for reference.

NOTE: No production vehicle should have more than a 50 mA (0.050 amp) draw.

8. If the draw is found to be excessive, pull fuses from the battery/central junction box one at a time and note the current drop. Do not reinstall the fuses until you are finished testing.

9. Check the wiring schematic in the wiring diagram for any circuits that run from the battery without passing through the battery/central junction box. Disconnect these circuits if the draw is still excessive.

Battery—Electronic Drains Which Shut Off When the Battery Cable is Disconnected

1. Repeat the steps of the battery drain testing.

2. Make sure all doors are closed and accessories are off. Without starting the engine, turn the ignition switch to RUN for a moment and then OFF. Wait a few minutes for the illuminated entry lamps to turn off if equipped.

3. Connect the ammeter and read the amperage draw.

The current reading (current drain) should be less than 50 mA (0.05 amp). If the current drain exceeds 50 mA (0.05 amp) after a few minutes, and if this drain did not show in previous tests, the drain is most likely caused by an inoperative electronic component. As in previous tests, remove the fuses from the battery/central junction box one at a time to locate the problem circuit.

Generator On-Vehicle Tests

CAUTION: To prevent damage to the generator, do not make jumper wire connections except as directed.

CAUTION: Do not allow any metal object to come in contact with the housing and the internal diode cooling fins with key on or off. A short circuit will result and burn out the diodes.

NOTE: Battery posts and cable clamps must be clean and tight for accurate meter indications.

NOTE: Refer to the Battery Tester Procedure Manual for complete directions for testing the charging system.

1. Turn off all lamps and electrical components.

2. Place the vehicle in transmission range NEUTRAL and apply the parking brake.

3. Carry out the Load Test and No-Load Test according to the following component tests:

Generator On-Vehicle Tests—Load Test

1. Switch the battery tester to the ammeter function.

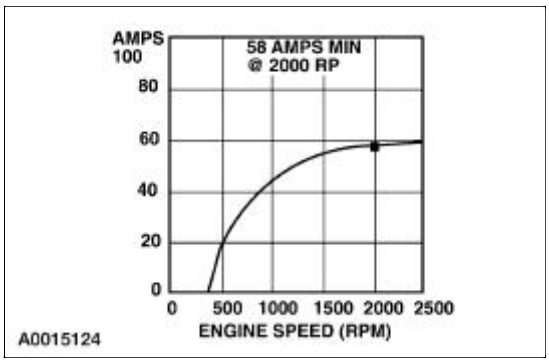
2. Connect the positive and negative leads of the battery tester to the corresponding battery terminals.

3. Connect the current probe to the generator B+ output terminal, circuit 38 (BK/OG).

4. With the engine running, turn the A/C on, the blower motor on high speed and the headlamps on high beam.

5. Increase the engine speed to approximately 2,000 rpm. The voltage should increase a minimum of 0.5 volt above the base voltage.
    - If the voltage does not increase as specified, carry out the Generator On-Vehicle Tests—No Load Test. For additional information, refer to Generator On-Vehicle Tests in this section.
    - If the voltage increases as specified, the charging system is operating normally.

6. With the engine running at 2,000 rpm, adjust the tester load bank to determine the output of the generator. Generator output should be at least 58 amps.



Generator On-Vehicle Tests—No Load Test

1. Switch the battery tester to the voltmeter function.

2. Connect the voltmeter positive lead to the generator B+ output terminal, circuit 38 (BK/OG) and the negative lead to ground.

3. Turn all electrical accessories off.

4. With the engine running at 2,000 rpm, check the generator output voltage. The voltage should be between 13.0 and 15.0 volts. If not, refer to the Symptom Chart.

General Specifications

Item	Specification
Manufacturer	Motorcraft
Voltage	12 volt
Amps at -17.7°C (0°F) cold crank	540
Minutes—reserve capacity	100
Amps/hrs.—20 hour rate	55
Location	Left front of engine compartment

Torque Specifications

Description	Nm	lb-ft	lb-in
Battery cable harness front support bracket nut	25	18	—
Battery cable terminal bolts	7	—	62
Battery hold-down bolt	10	—	89
Battery junction box nut	20	15	—
Battery tray bolts	11	8	—
Front lower cable harness bracket nuts	11	8	—
Generator B+ cable nut	8	—	71
Battery cable bracket nut (left upper)	25	18	—
Battery ground cable nut (engine block)	25	18	—
Battery ground cable at the radiator support bolt	12	9	—
Positive battery cable nut (starter solenoid)	12	9	—
Positive battery wire nut (starter solenoid)	6	—	53
Right engine mount cable harness bracket nut	25	18	—

Battery and Cables

Vehicles are equipped with a 12 volt maintenance-free battery that contains a built-in hydrometer. The hydrometer eye indication is as follows:

- A green dot means the battery is OK.
- A yellow dot, red dot, or when the green dot is not visible, means the battery needs to be charged.

WARNING: Batteries normally produce explosive gases which can cause personal injury. Therefore, do not allow flames, sparks or lighted substances to come near the battery. When charging or working near a battery, always shield your face and protect your eyes. Always provide ventilation.

WARNING: When lifting a battery, excessive pressure on the end walls could cause acid to leak out through the vent caps, resulting in personal injury, damage to the vehicle or the battery.

WARNING: Keep out of the reach of children. Batteries contain sulfuric acid. Avoid contact with skin, eyes, or clothing. Also, shield your eyes when working near the battery to protect against possible splashing of the acid solution. In case of acid contact with skin or eyes, flush immediately with water for a minimum of 15 minutes and get prompt medical attention. If acid is swallowed, call a physician immediately.

Ford Motor Company strongly recommends that lead-acid batteries be returned to an authorized recycling facility for disposal.

Battery

Special Tool(s)

ST2442-A	Micro 490 Digital Battery Analyzer 162-00004

Inspection and Verification

1. Verify the customer concern by operating the system.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
● Battery ● Battery mounting	● Battery cables ● Battery posts

3. If an obvious cause for a concern is found, correct the cause before proceeding to the next step.
4. If the fault is not visually evident, proceed to the pinpoint test.

Pinpoint Tests

PINPOINT TEST A: BATTERY CONDITION TEST

Test Step	Result / Action to Take
A1 TEST BATTERY CONDITION	
NOTE: No battery with a red test-eye should be replaced. The red eye only means the battery is discharged, not necessarily defective. **NOTE:** Failure to fully charge the battery before retesting may cause false readings. ● Verify the battery condition using the Battery Analyzer. ● **Is the battery OK?**	**Yes** Does the meter read, GOOD BATTERY? RETURN the battery to service. REFER to Section 414-00 . Does the meter read, GOOD-RECHARGE? CHARGE the battery and RETURN to service. REFER to Section 414-00 . Does the meter read, CHARGE & RETEST? Fully CHARGE the battery and RETEST.

	No Does the meter read, REPLACE BATTERY? INSTALL a new battery. Does the meter read, BAD CELL-REPLACE? INSTALL a new battery.

Battery Disconnect

WARNING: Batteries normally produce explosive gases which can cause personal injury. Therefore, do not allow flames, sparks or lighted substances to come near the battery, always shield your face and protect your eyes. Always provide ventilation. Failure to follow these instructions may result in personal injury.

WARNING: To avoid accidental deployment and possible injury, the backup power supply must be depleted before repairing or installing any front or side air bag supplemental restraint system (SRS) components and before repairing, installing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches. Failure to follow these procedures may result in personal injury.

Refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped). Failure to follow these instructions may result in personal injury.

WARNING: When lifting a battery, excessive pressure on the end walls could cause acid to spew through the vent caps, resulting in personal injury. Lift with a battery carrier or with your hands on opposite corners. Failure to follow these instructions may result in personal injury.

WARNING: Keep out of the reach of children. Batteries contain sulfuric acid. Avoid contact with skin, eyes or clothing. Also, shield your eyes when working near the battery to protect against possible splashing of the acid solution. In case of acid contact with the skin or eyes, flush immediately with water for a minimum of 15 minutes and get prompt medical attention. If acid is swallowed, call a physician immediately. Failure to follow these instructions may result in personal injury.

1. **NOTE:** When the battery is disconnected and reconnected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The vehicle may need to be driven to relearn its strategy.

   Disconnect the battery ground cable.

2. Disconnect the positive battery cable.

3. To install, reverse the removal procedure.

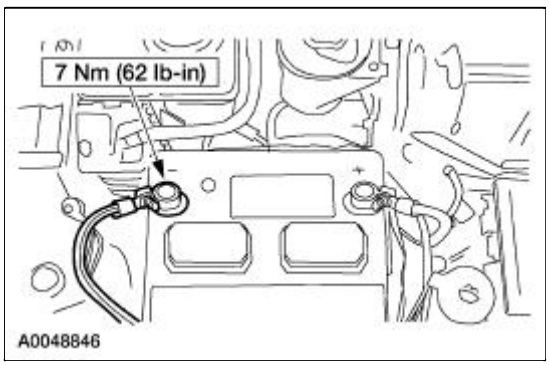
Battery

Removal and Installation

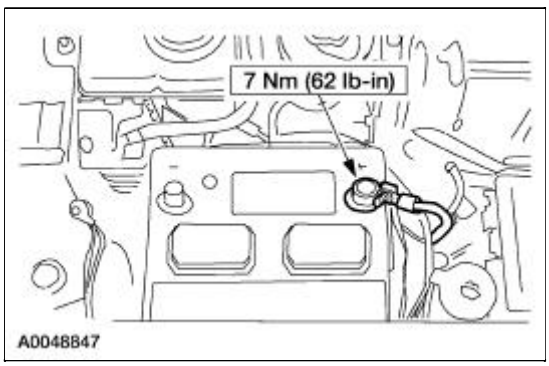
WARNING: Batteries normally produce explosive gases which can cause personal injury. Therefore, do not allow flames, sparks or lighted substances to come near the battery. When charging or working near a battery, always shield your face and protect your eyes. Always provide ventilation. Failure to follow these instructions may result in personal injury.

WARNING: Keep out of the reach of children. Batteries contain sulfuric acid. Avoid contact with skin, eyes, or clothing. Also, shield your eyes when working near the battery to protect against possible splashing of the acid solution. In case of acid contact with skin or eyes, flush immediately with water for a minimum of 15 minutes and get prompt medical attention. If acid is swallowed, call a physician immediately. Failure to follow these instructions may result in personal injury.

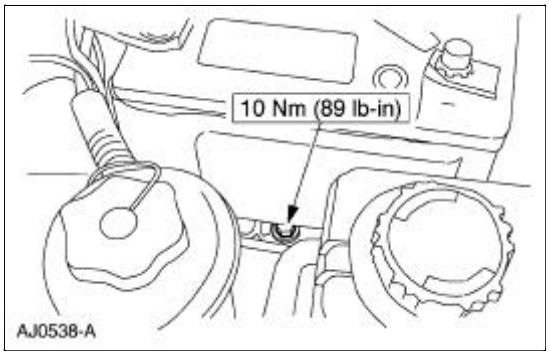
1. Loosen the bolt and disconnect the battery ground cable.



2. Loosen the bolt and disconnect the positive battery cable.

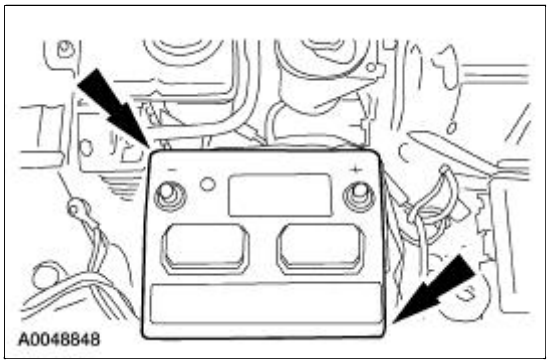


3. Remove the bolt and the battery hold-down.



4. **WARNING: When lifting a battery, excessive pressure on the end walls may cause acid to leak out through the vent caps, resulting in personal injury, damage to the vehicle or the battery. Failure to follow these instructions may result in personal injury.**

   Remove the battery by lifting from the corners of the battery.



5. **NOTE:** When the battery is disconnected and reconnected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The vehicle needs to be driven to relearn the strategy.

   To install, reverse the removal procedure.

Battery Tray

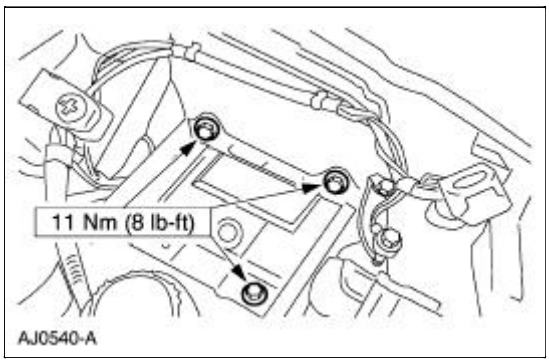
Removal and Installation

WARNING: Batteries normally produce explosive gases which can cause personal injury. Therefore, do not allow flames, sparks or lighted substances to come near the battery. When charging or working near a battery, always shield your face and protect your eyes. Always provide ventilation. Failure to follow these instructions may result in personal injury.

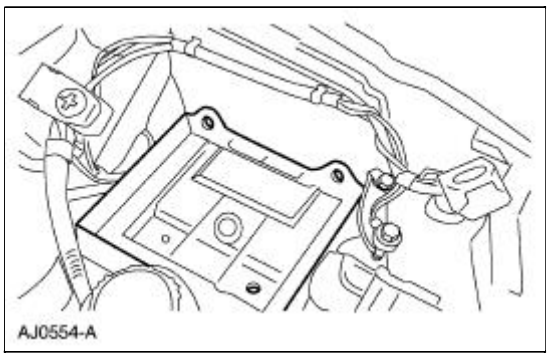
WARNING: Keep out of the reach of children. Batteries contain sulfuric acid. Avoid contact with skin, eyes, or clothing. Also, shield your eyes when working near the battery to protect against possible splashing of the acid solution. In case of acid contact with skin or eyes, flush immediately with water for a minimum of 15 minutes and get prompt medical attention. If acid is swallowed, call a physician immediately. Failure to follow these instructions may result in personal injury.

1. Remove the battery. For additional information, refer to Battery in this section.

2. Remove the battery tray bolts and washers.



3. Remove the battery tray.



4. **NOTE:** When the battery is disconnected and reconnected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The vehicle needs to be driven to relearn the strategy.

   To install, reverse the removal procedure.

Battery Cables

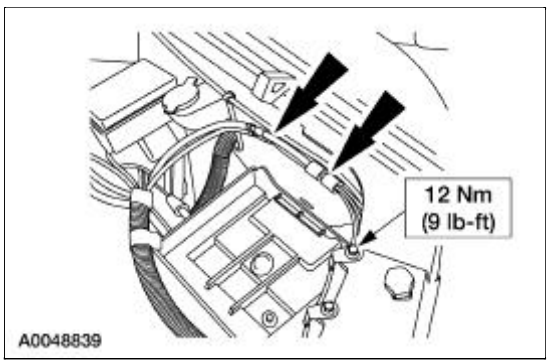
Removal

WARNING: Batteries normally produce explosive gases which can cause personal injury. Therefore, do not allow flames, sparks or lighted substances to come near the battery. When charging or working near a battery, always shield your face and protect your eyes. Always provide ventilation. Failure to follow these instructions may result in personal injury.

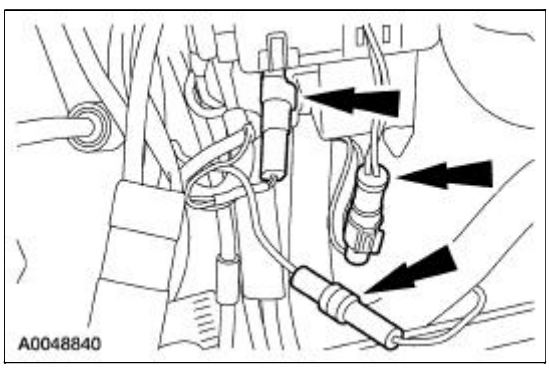
WARNING: Keep out of the reach of children. Batteries contain sulfuric acid. Avoid contact with skin, eyes, or clothing. Also, shield your eyes when working near the battery to protect against possible splashing of the acid solution. In case of acid contact with skin or eyes, flush immediately with water for a minimum of 15 minutes and get prompt medical attention. If acid is swallowed, call a physician immediately. Failure to follow these instructions may result in personal injury.

All vehicles

1. Remove the battery. For additional information, refer to Battery in this section.
2. If equipped, unplug the engine heater intermediate connection.
3. Remove the battery ground cable harness bolt from the radiator support and release the cable harness locators.



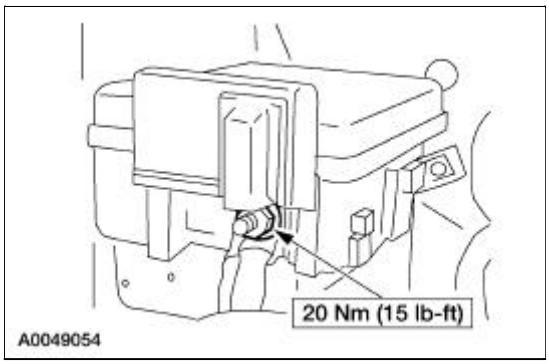
4. Disconnect the battery cable harness electrical connectors.



5. **CAUTION: The square terminal from the battery must be installed first, followed by**

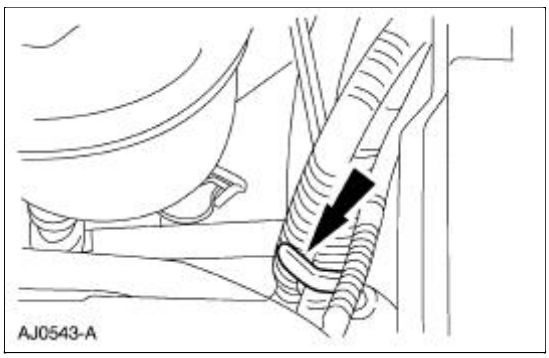
the round terminal from the generator. Reversing this sequence may cause circuit failure or arcing.

Remove the battery junction box nut and position the positive battery cable and generator B+ cable aside.



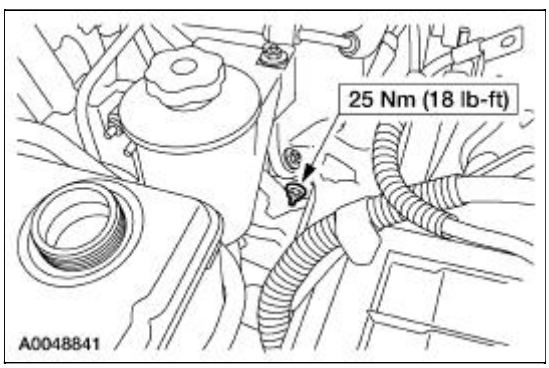
Vehicles with 3.8L and 4.6L 2V engines

6. Remove the cable harness front support bracket by removing the nut, and position the bracket aside.



Vehicles with 4.6L 4V engines

7. Remove the nut and position the left upper battery cable bracket aside.



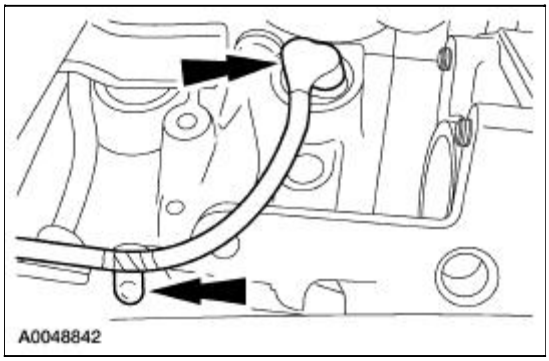
All vehicles

8. Raise and support the vehicle. For additional information, refer to Section 100-02 .

9. **NOTE:** 4.6L 4V shown; 3.8L and 4.6L 2V similar.

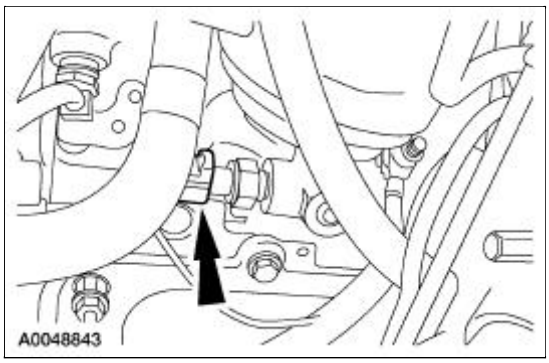
   If equipped, remove the block heater plug from the block heater and the harness locators from

the oil pan clips.



10. **NOTE:** 4.6L 4V shown; 3.8L and 4.6L 2V similar.

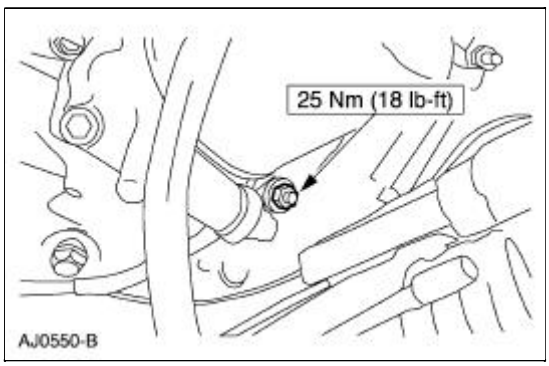
    Disconnect the oil pressure sender unit electrical connector.



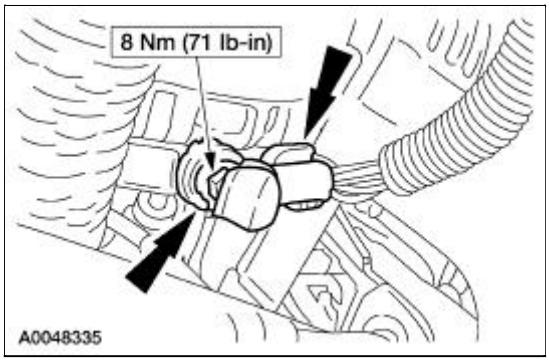
11. **CAUTION: Failure to tighten the negative cable ground nut may cause ground circuit failure or arcing.**

    NOTE: 4.6L 2V shown; 3.8L and 4.6L 4V similar.

    Remove the battery ground cable nut at the engine block.

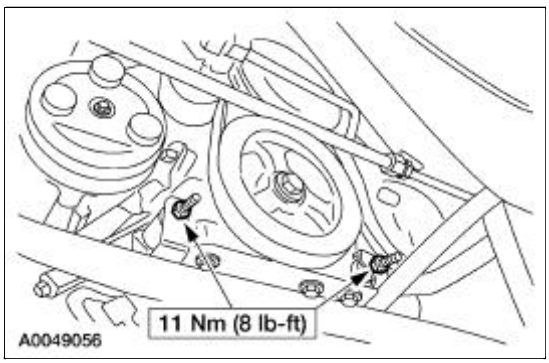


12. Remove the nut and disconnect the generator electrical connections.
    - Position the cover aside.



13. **NOTE:** 4.6L 2V shown; 3.8L and 4.6L 4V similar.

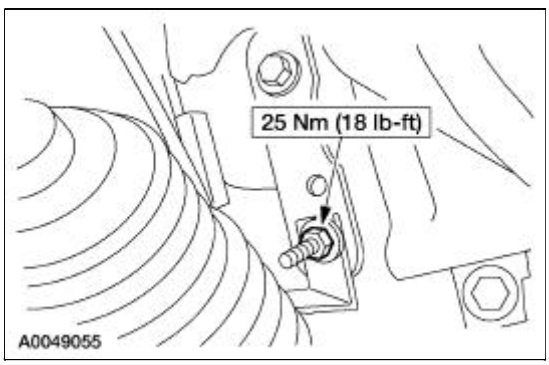
    Remove the front lower cable harness bracket nuts.



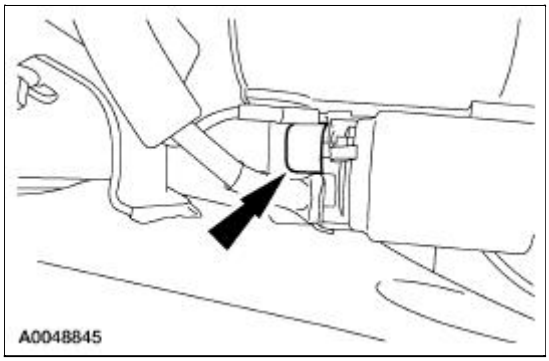
14. Pull the harness assembly downward until it clears the engine/radiator area.

15. **NOTE:** 4.6L 2V shown; 3.8L and 4.6L 4V similar.

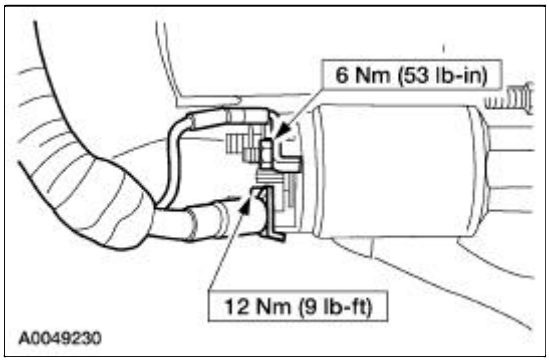
    Remove the right engine mount cable harness bracket nut.



16. Remove the cover from the starter solenoid connections.



17. Remove the nuts and disconnect the starter solenoid electrical connections.



18. Pull the harness forward until it clears the motor mount, then remove the entire battery cable harness from the vehicle.

Installation

1. **NOTE:** When the battery is disconnected and reconnected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The vehicle needs to be driven to relearn the strategy.

   To install, reverse the removal procedure.

General Specifications

Item	Specification
Generator 6G, 3.8L	1R3U-BA
Generator 6G, 4.6L 2V	XR3U-AB
Generator 4G, 4.6L 4V	2R3V-AA
Generator, 3.8L	65-110 amp (max) @ 1,500-6,000 gen rpm (3.03:1 ratio)
Generator, 4.6L 2V	50-110 amp (max) @ 1,500-6,000 gen rpm (3.16:1 ratio)
Generator, 4.6L 4V	58-120 amp (max) @ 1,500-6,000 gen rpm (2.87:1 ratio)
Electronic regulator internal to generator	—

Torque Specifications

Description	Nm	lb-ft	lb-in
Generator lower mounting bolts, 4.6L 2V	25	18	—
Generator mounting bolt, 3.8L upper	25	18	—
Generator mounting bolt, 3.8L lower	47	35	—
Generator upper mounting bolts, 4.6L 4V	50	37	—
Generator lower mounting bolt, 4.6L 4V	25	18	—
Generator mounting support bracket bolts, 4.6L 2V	10	—	89
Battery positive cable nut (B+) at generator	8	—	71

Generator

The charging system consists of the:

- generator (GEN)
- internal voltage regulator

The generator has an internal voltage regulator that is not installed separately. The generator and voltage regulator are installed as an assembly.

Generator

Refer to Section 414-00 .

Generator —3.8L

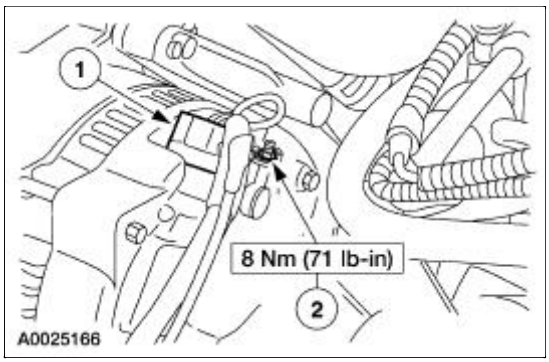
Removal and Installation

1. Disconnect the battery (10655). For additional information, refer to Section 414-01 .

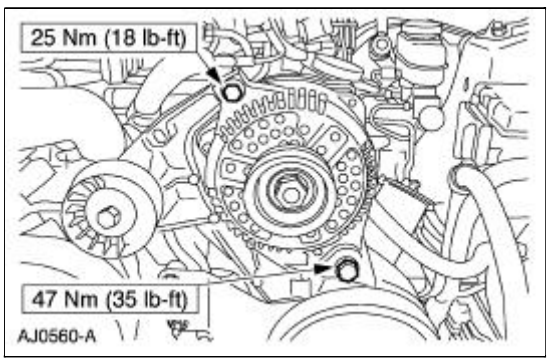
2. Relieve the accessory drive belt (8620) tension and remove the belt from the generator pulley. Leave the belt in place for reinstallation. For additional information, refer to Section 303-05 .

3. **CAUTION: This is a new style connector that has a press-to-release tab. Pulling on the tab could result in damage to the connector or harness.**

   Disconnect the generator (10300).
   1. Disconnect the generator electrical connectors.
   2. Remove the battery positive cable nut.



4. Remove the generator.
   - Remove the upper and lower generator bolts.



5. To install, reverse the removal procedure.

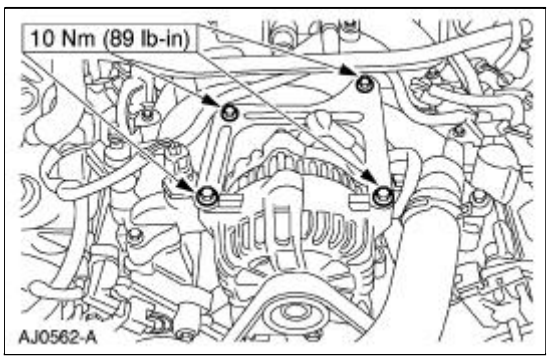
Generator —4.6L 2V

Removal and Installation

1. Disconnect the battery (10655). For additional information, refer to Section 414-01 .

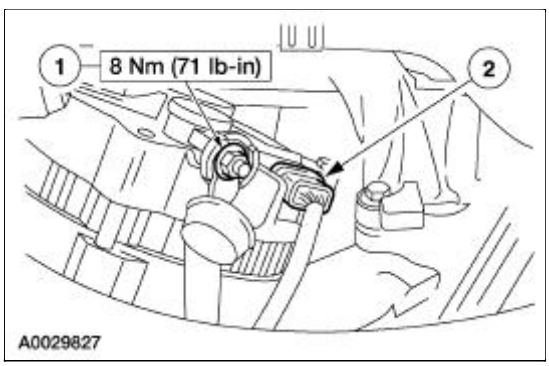
2. Relieve the accessory drive belt (8620) tension and remove the belt from the generator pulley. Leave the belt in place for reinstallation. For additional information, refer to Section 303-05 .

3. Remove the bolts on the upper generator bracket and remove the bracket.

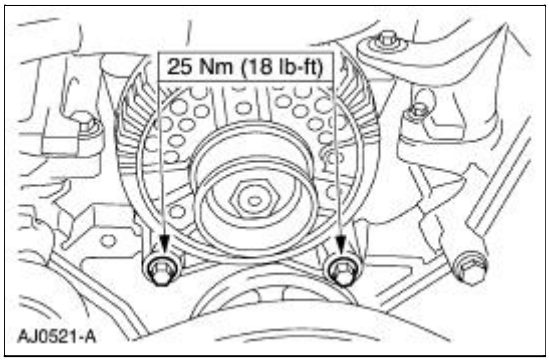


4. **CAUTION: This is a new style connector that has a press-to-release tab. Pulling on the tab could result in damage to the connector or harness.**

   Disconnect the generator electrical connections.
   1. Remove the battery positive cable nut (1) and cable.
   2. Disconnect the generator electrical connector.



5. Remove the lower generator bolts and remove the generator.

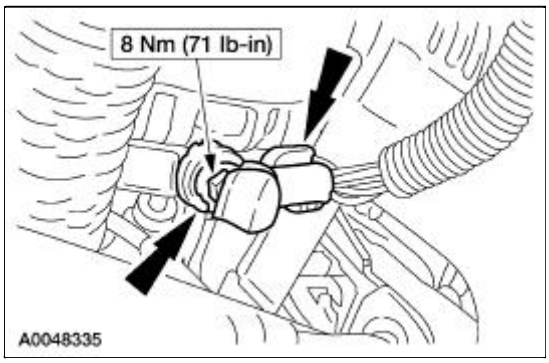


6. To install, reverse the removal procedure.

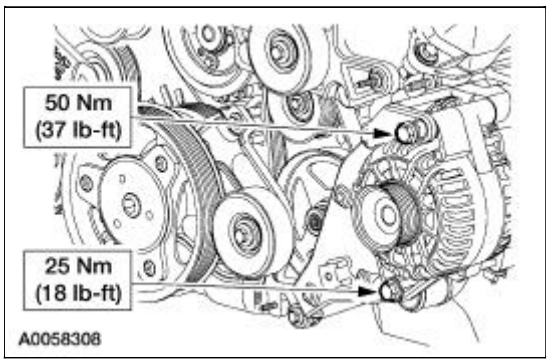
Generator —4.6L 4V

Removal and Installation

1. Disconnect the battery. For additional information, refer to Section 414-01 .
2. Relieve the accessory drive belt tension and remove the belt from the generator pulley.
3. Raise and support the vehicle. For additional information, refer to Section 100-02 .
4. Disconnect the generator electrical connections.
   - Disconnect the electrical connector.
   - Position the cover aside, and remove the nut and battery positive cable.



5. Remove the upper and lower generator bolts.



6. Remove the generator by lifting up and pulling it forward.
7. To install, reverse the removal procedure.